Petitioned Health Consultation

NORTH CASPER PCE PLUME

CASPER, NATRONA COUNTY, WYOMING

CERCLIS NO. WYD988869764

AUGUST 26, 1999

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members.

This document has previously been released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The health consultation has now been reissued. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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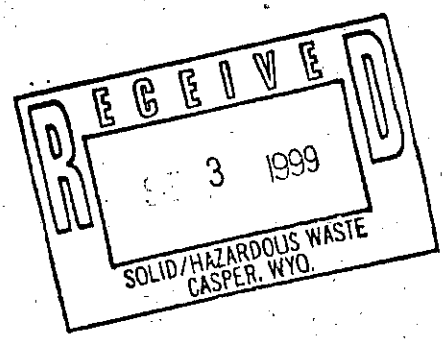
DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

August 31, 1999



Ms. Linda Fivas
WDEQ
3030 Energy Lane
Suite 200
Casper, WY 82604

Dear Ms. Fivas:

Enclosed please find a copy of the petitioned health consultation for North Casper PCE Plume, Casper, Natrona County, Wyoming, dated August 26, 1999. This petitioned health consultation is in response to a concerned citizen's request for the Agency for Toxic Substances and Disease Registry to conduct a health study and determine the potential health effects caused by exposure to groundwater, soil, and air contamination resulting from the North Casper PCE Plume site.

Please address correspondence to the Chief, Program Evaluation, Records, and Information Services Branch, Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, ATTN: North Casper PCE Plume, 1600 Clifton Road, NE (E56), Atlanta, Georgia 30333.

If there are any questions, please direct them to Gail Scogin, the health assessor, at (404) 639-0668.

Sincerely yours,

Max M. Howie, Jr.
Chief, Program Evaluation, Records,
and Information Services Branch
Division of Health Assessment
and Consultation

Enclosure

PETITIONED HEALTH CONSULTATION

NORTH CASPER PCE PLUME

CASPER, NATRONA COUNTY, WYOMING

CERCLIS NO. WYD988869764

Prepared by:

Petition Response Section
Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

On March 1, 1994, a concerned citizen requested that the Agency for Toxic Substances and Disease Registry (ATSDR) conduct a health study in North Casper, Wyoming. The citizen expressed concern about the potential health effects caused by exposure to groundwater, soil, and air contamination resulting from the North Casper PCE Plume site and other unspecified sources in the area [1]. The purpose of this health consultation is to summarize previous ATSDR public health recommendations, to evaluate more recent data, and to recommend follow-up public health actions for the site.

North Casper is approximately one square mile in area. It is bounded on the south by Interstate 25, on the north and west by the North Platte River, and on the east by Beverly Street. Two separate groundwater plumes, contaminated primarily with tetrachloroethylene (PCE), have been identified in North Casper. These plumes are located in the surficial aquifer which is from eight to twelve feet below the ground surface [2]. The North Casper community has a population of about 3300 people [3] as well as some small commercial businesses and two public schools. A map of the site is shown in Figure 1.

There have been numerous environmental investigations and reports documenting soil, groundwater, and indoor air contamination in North Casper. In 1989, a consultant for the city of Casper conducted an investigation to determine the extent of possible petroleum contamination in the soil and groundwater at the former City Maintenance Garage, located at 1255 North Beech Street. The results indicated that the groundwater was contaminated with PCE and that a plume of PCE-contaminated soil vapor was also present. The PCE appeared to originate from a source located to the southwest of the garage. PCE was detected in soil vapor samples, collected at a depth of 0 - 3 feet, at a maximum concentration of 400,000 parts per billion (ppb) and in groundwater at a maximum concentration of 3800 ppb [4].

In late 1989, the U.S. Environmental Protection Agency (EPA) conducted a sampling investigation to determine the extent of PCE contamination near the maintenance garage. Soil vapor samples were collected from 74 locations and groundwater samples were collected at seven existing monitoring wells. The results indicated that the plume (to become known as the west plume) extended from a former dry cleaning establishment in a northeasterly direction toward the river [2].

In 1991, a North Casper resident contacted ATSDR concerning the possibility of indoor air contaminants in her home located above the west plume. She was particularly concerned about bringing her infant, then hospitalized with congenital heart defects, into the home [5]. At ATSDR's request, EPA collected indoor air samples from the residence in May 1991. The highest PCE level found in the living space of the residence was 24 ppb. In a health consultation issued on June 24, 1991, ATSDR concluded that the detected levels of PCE and formaldehyde

(maximum level of 170 ppb) were not likely to pose a non-carcinogenic health risk to the infant or any other family member. ATSDR further concluded that the levels of PCE and formaldehyde may pose a slightly increased cancer risk. ATSDR stated that the data were insufficient to determine the source of the indoor air PCE contamination and recommended continued monitoring of the PCE plume [6].

At the request of EPA, ATSDR issued a second health consultation on April 19, 1993 after a review of soil vapor and groundwater data. EPA's request was prompted when the U.S. Department of Housing and Urban Development (HUD) denied a Block Development Grant for home repairs to a resident of North Casper. HUD required an "assessment of risk to children digging in the soils" before reconsidering the application. ATSDR determined that children digging in soils may be exposed to PCE but that a quantitative determination of exposure to PCE was not possible. ATSDR also concluded that migration of PCE through the concrete floor of residential units located over the plume may result in exposure of residents to PCE. ATSDR recommended that indoor air monitoring for PCE be considered in residences located over the plume [4].

In response to the ATSDR recommendations, the Wyoming Department of Environmental Quality (WDEQ) sampled indoor air in a total of 113 residences and other buildings during May/June 1994 (the summer sampling event). The highest PCE level detected was 8 ppb. A winter sampling event occurred in January/February 1995 when 80 residences and buildings were sampled. Concentrations at that time ranged from 3 to 76 ppb. The two highest concentrations were 76 and 50 ppb. However, these two residences were not located within the known boundaries of the PCE plume. Since these samples had been collected in closets, it was suspected that household materials may have contributed to the PCE levels. During February, March, and April 1995, air samples were collected in another residence within the known boundary of the plume. PCE was detected there in floor level closets and cabinets at a maximum concentration of 74 ppb and in living spaces at a maximum concentration of 38 ppb. WDEQ attributed these elevated levels to contaminant migration from groundwater and soil vapor from beneath the residence [7].

WDEQ also collected groundwater and soil vapor samples during the 1994 summer sampling event. The results confirmed that the North Casper plume originates at the former dry cleaning facility and migrates to the northeast. This study also showed that groundwater contaminated with PCE occurs in the two separate and apparently unrelated "east" and "west" plumes. The maximum PCE levels in the west plume, originating from the dry cleaning facility, were 1300 ppb in groundwater and 500,000 ppb in soil vapor. The east plume, located in the southeast portion of North Casper, originates south of I-25 and extends northeast to the river. The maximum PCE levels found in the east plume were 449 ppb in the groundwater and 12,580 ppb in the soil vapor [2].

The WDEQ results also showed the presence of trichloroethylene (TCE) in the groundwater and soil vapor. The location and levels found suggested that TCE may be present as a degradation product of PCE. In the area of the west plume, the maximum level of TCE was 24 ppb in groundwater and 20,320 ppb in soil vapor [2].

WDEQ requested that ATSDR review the analytical data from the May/June 1994 and January/February 1995 sampling events to determine if PCE was present in residential indoor air at levels of public health concern. In a health consultation dated August 24, 1995, ATSDR concluded that PCE levels in some residences may present a public health threat, but only if exposure to these levels is long-term, frequent, and regular. The data indicated, however, that PCE was generally in non-living spaces such as closets and, as a result, long-term exposure to PCE in these areas is not likely. ATSDR recommended that periodic air monitoring for PCE be conducted because the amount of PCE migrating into the residences may fluctuate as environmental conditions change over time [7].

In response to community concerns and ATSDR recommendations, WDEQ collected additional indoor air samples during 1996, 1997, and 1998. WDEQ selected homes that pose the greatest potential for PCE vapor migration, such as those constructed below-grade or on concrete slabs, as well as residences where PCE has been detected previously [8]. ATSDR has reviewed the 1996-1998 data to determine if recent indoor air levels present a public health threat.

Discussion

Indoor Air

In March 1996, samples were collected from 17 residences and two schools [9]. Twenty one samples were collected during August/September 1996 and again in March/April 1997 [10,11]. A total of 30 separate locations were sampled during these three events, including a residence located over the west plume where previous readings were as high as 74 ppb. Most of the locations were located near the known location of either the west or east plume. The highest PCE level found during any of these sampling events was 18 ppb.

In May 1998, additional air samples were collected from a total of ten locations [12]. Six of the samples were collected from living spaces in residences, one from a school office, one from a shop building, and two from outdoor locations. Each sample was collected over a 24-hour period and analyzed for PCE and other volatile organic compounds (VOCs). The other VOCs analyzed were:

vinyl chloride
1,1-dichloroethene (1,1-DCE)

methylene chloride
1,1-dichloroethane
1,1,1-trichloroethane (1,1,1-TCA)
1,2-dichloroethane (1,2-DCA)
trichloroethene (TCE)
1,1,2,2-tetrachloroethane

In the May 1998 sampling event, the highest PCE level found was 7.2 ppb in the residence where former levels of PCE were as high as 74 ppb.

The 1996-1998 PCE levels are lower than those which would be expected to create any non-carcinogenic health effects. ATSDR's current comparison value of 40 ppb is based on increased reaction time in dry cleaning workers exposed to an average of 15,000 ppb PCE for about 10 years and contains a safety factor of 100 [13]. A safety factor of 100 means that the comparison value is 100 times smaller than the lowest level shown to have any health effect. Therefore, even under the worst-case exposure found in the North Casper indoor air, no public health threat is likely. The levels of PCE found are also unlikely to cause carcinogenic health effects. No cancer effects would be expected to occur within the population of North Casper as a result of exposure to PCE in indoor air.

The other VOCs that warranted further evaluation were 1,1-DCE; 1,2-DCA; and TCE. The remaining VOCs, including vinyl chloride, were either not found or were found at a level below the ATSDR screening value. When a contaminant is below ATSDR's screening value, ATSDR considers that even long-term exposure to sensitive populations at that level would not result in an increase in the likelihood of developing adverse health effects.

The highest level of 1,1-DCE was found in a residence at 0.28 ppb. This level is more than 70 times lower than ATSDR's comparison value and is not expected to cause non-carcinogenic effects. Since the evidence for the carcinogenicity of 1,1-DCE is weak in animals as well as humans, this level is also not expected to cause cancer effects.

The compound, 1,2-DCA was found inside the City Shop building at a level of 0.35 ppb. The highest level found in a residence was 0.13 ppb. A level of 0.35 ppb is more than 500 times less than ATSDR's comparison value for non-cancer health effects. There is no evidence directly linking inhalation exposure to 1,2-DCA to cancer in humans or animals. As a result, these levels are also not expected to cause cancer effects.

The highest level of TCE was found in a residence at 0.75 ppb. This level is more than 100,000 times lower than a level that has produced any adverse effect in animals, either cancerous or non-

cancerous. Therefore, the levels of TCE found are not expected to pose any public health hazard to exposed residents.

Groundwater

Groundwater sampling conducted in 1994 by WDEQ identified PCE levels ranging from non-detectable to 1300 ppb. Other volatile organic constituents were also found. The highest levels of TCE and 1,1,1-TCA were 24 ppb and 19 ppb respectively. Vinyl chloride was not detected [2]. The PCE and TCE levels exceed the drinking water Maximum Contaminant Limits (MCLs) of 5 ppb [2]. Local advisories warning residents not to use private groundwater wells for potable purposes are still in effect [14]. ATSDR has reviewed the results from more recent groundwater sampling to determine if contaminant levels have changed significantly and will document this evaluation in a future health consultation.

Soil Vapor

Soil gas surveying involves the sampling and analysis of gases (vapors) collected from the subsurface soil pore spaces. This surveying is a screening technique often used to delineate the lateral extent of VOC contamination in groundwater. The technique involves driving a hollow probe into the ground, applying a vacuum to collect a soil vapor sample, and analyzing the sample using portable, field equipment.

In 1994, WDEQ conducted a soil gas survey, collecting a total of 99 soil vapor samples from a depth of about nine feet. The PCE levels in these soil vapor samples ranged from non-detectable to 500,000 ppb. The highest level of TCE found was 20,320 ppb. Although the samples were also screened for 1,1,1-TCA, none was detected [2]. Vinyl chloride was not one of the VOCs screened for during the soil gas survey. However, vinyl chloride leachate was not detected in any of the nine samples of soil cuttings collected during the monitoring well installation activities [2].

In 1993, based on similar results from the 1991 EPA investigation, ATSDR determined that while outdoor exposure to contaminated soil vapor is possible, it is not likely that contaminant concentrations in the breathing zone will be elevated continuously. Any PCE migrating from the soil vapor will be dispersed and diluted in the ambient air [4]. In addition, measurements from subsurface soil gas surveys greatly overestimate the contaminant levels resulting from natural, passive migration that may be found at the ground surface or in the breathing zone.

Municipal Drinking Water

In 1991, the city of Casper and EPA took samples of the water distribution system from 17 separate taps in North Casper [14]. Each year since then, the city of Casper has tested the water distribution system in North Casper [15]. In 1994, the City of Casper's Public Utilities Division conducted an intensive sampling of North Casper's water distribution system in order to reassure residents that no PCE had entered the system [15]. A total of 74 water samples were collected from the outside taps of homes and businesses in the North Casper and north downtown areas of Casper [16]. So far, all tests have shown that PCE concentrations are well below the Safe Drinking Water Act standards [16]. To ensure that the water is safe, the city of Casper will annually test the water distribution system in the North Casper area for PCE [16]. In addition, the City regularly tests its water for all VOCs prior to distribution and the results indicate that Casper's drinking water meets EPA drinking water standards [17]. This information has been forwarded for ATSDR review and the results of ATSDR's evaluation will be provided in a future health consultation.

Community Health Concerns

Residents have expressed concerns about the potential for PCE vapors to migrate into homes and outdoor recreational areas. In addition, residents have been concerned that contaminated groundwater could infiltrate the municipal drinking water supply lines as well as contaminate lawns and gardens if used for irrigation. The city of Casper and EPA have advised area residents not to use private well water for indoor potable purposes. EPA and ATSDR have emphasized that neither water from sprinklers nor fruits and vegetables grown with contaminated groundwater pose a health risk [14].

Studies indicate that the municipal water supply has not been affected by the PCE groundwater contamination. Since PCE has never been detected in the municipal water supply, direct exposure to PCE in drinking water is unlikely. Also, due to the high operating pressures in municipal supply lines, PCE infiltration would not be expected to occur. However, the city of North Casper continues to monitor the drinking water supply prior to and after distribution to ensure that it poses no risk to the community [16].

There have also been concerns about the levels of TCE found in the water supply for a trailer park in North Casper. The TCE contamination found in the groundwater wells appears to be unrelated to the two main PCE groundwater plumes. In 1989, TCE was found at levels as high as 14 ppb. Subsequently, a carbon filtration unit was installed to remove VOCs from the well water prior to use by trailer park residents. ATSDR reviewed 1997-1999 VOC analyses for the filtered water. In 1998, TCE was found at a level of 1.41 ppb, which is well below one that would be likely to cause any adverse health effects.

Public Health Concerns

In 1994, a resident petitioned ATSDR to conduct a symptom-prevalence study in North Casper [1]. The purpose of such a study would be to determine if residents' health has been affected by exposure to PCE and other chemicals found in their air and water. ATSDR responded that health assessments and consultations were often initial steps in the assessment process. Subsequently, the members of ATSDR's Health Assessment Review Panel (HARP) reviewed the available data and deferred a final decision on conducting a health study until additional indoor air and private well usage data were available for evaluation.

In addition to conducting additional indoor air sampling, WDEQ provided information to ATSDR about all known residential wells in the North Casper area. WDEQ catalogued all registered wells, identified the known unregistered wells, listed the well testing results, and summarized the numerous efforts to publicize restrictions on groundwater usage. WDEQ informed ATSDR that neither WDEQ nor the City of Casper - Natrona County Health Department have received any indication that private wells were being used for drinking water [18].

The only documented exposure to PCE has been via indoor air. The maximum levels of PCE and other VOCs in indoor air to which residents have been exposed at North Casper are unlikely to produce adverse effects, even with chronic exposure. Therefore, the findings of a symptom-prevalence study would be unrelated to residential PCE exposures. As a result, a study to determine if residents' health has been affected by exposure to PCE has not been recommended.

ATSDR Child Health Initiative

ATSDR considers children in the evaluation of all exposures. In its evaluation of the levels of PCE and other VOCs found in residential indoor air, ATSDR used health guidelines that are protective for children. ATSDR did not identify any exposures to chemical contaminants at levels of health concern for children.

Conclusions

ATSDR classifies the North Casper PCE Plume Site as **No Apparent Public Health Hazard**.

1. Based on a review of the available data, ATSDR concludes that PCE continues to be detected in indoor air in some residences in North Casper although at lower than previously detected levels.

2. The most recent PCE and other VOC levels found in indoor air are not expected to present a public health threat.

3. There is no indication that North Casper residents are being exposed to PCE in municipal drinking water supplies.

4. Residents of the Riverside Mobile Home Court are not exposed to levels of TCE or other VOCs that are expected to present a public health threat.

5. While exposure to PCE-contaminated soil vapor is possible, it is unlikely to present a public health threat.

These conclusions are based on the available data associated with contamination at the North Casper PCE Plume site. Additional data could alter the advice being presented. ATSDR will review additional data or will respond to additional requests as needed.

Recommendations

ATSDR issues the following precautionary recommendations as conservative public health measures for this site:

1. Reduce or eliminate household PCE contamination resulting from the storage and use of PCE-containing consumer products.

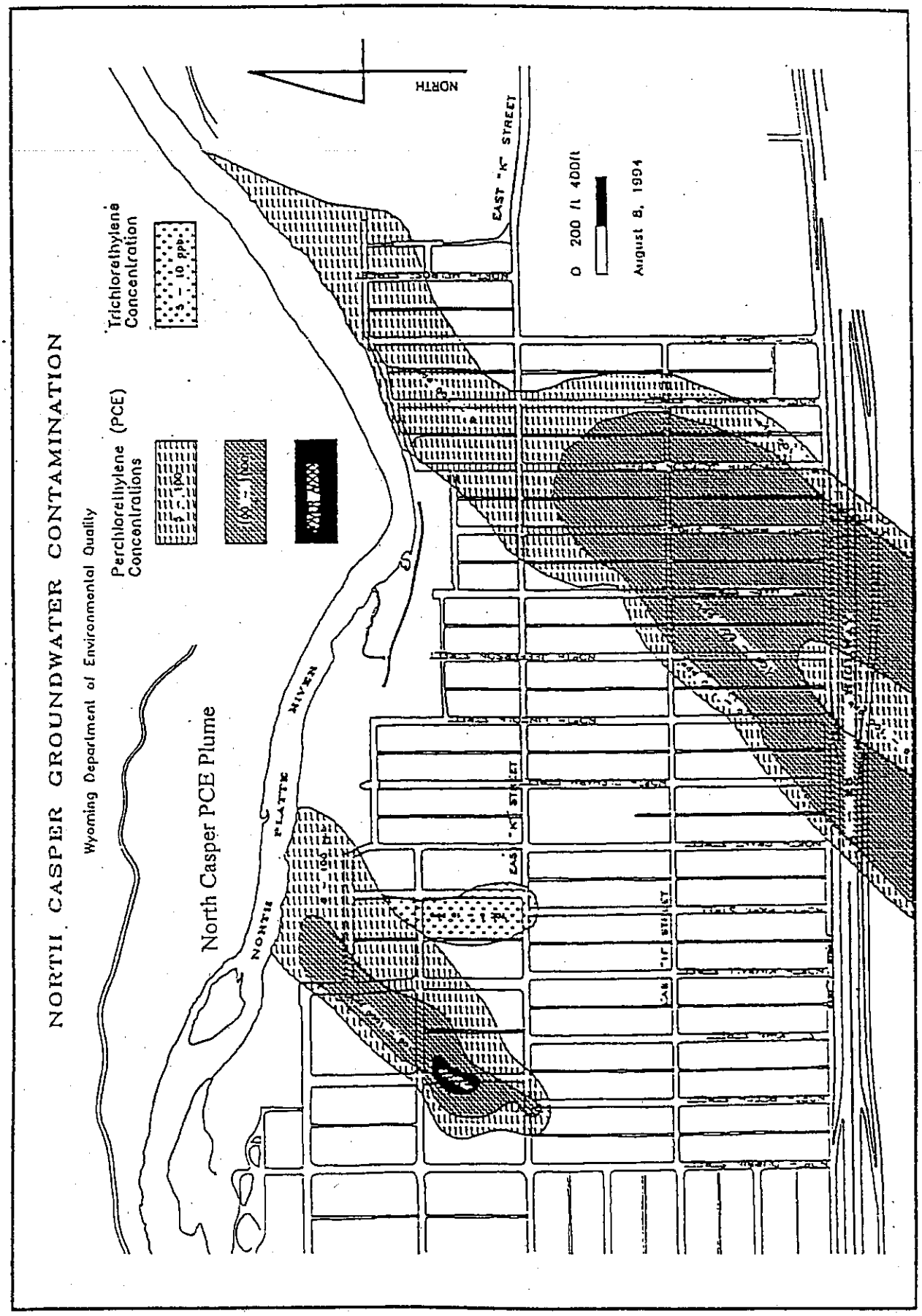
2. Periodically monitor the groundwater to assess the migration of contaminant plumes. If PCE or other VOC groundwater levels increase or the contaminant plumes move to currently unaffected areas, further indoor air monitoring is warranted.

3. Routinely monitor for PCE and other VOCs in the municipal water prior to distribution. Due to the high pressures maintained in the supply lines, PCE infiltration from groundwater is not expected to occur.

4. Continue periodic monitoring for VOCs in the water supply for the Riverside Mobile Home Court.

5. Minimize potential exposure to contaminated soil vapor during any excavation activities through the use of standard hazardous materials health and safety practices.

Figure 1


NORTH CASPER GROUNDWATER CONTAMINATION
Wyoming Department of Environmental Quality
Trichloroethylene Concentration
3 - 10 ppb
Perchloroethylene (PCE) Concentrations
5 - 100
100 - 1000
1000 - 10000
North Casper PCE Plume
NORTH PLATTE RIVER
EAST "K" STREET
"K" STREET
CASPER STREET
0 200 ft 400ft
August 8, 1994

References

1. Pollution Posse. Letter from Linda Burkhart, Director, Pollution Posse to Dr. Barry Johnson; request for health study for the North Casper area. March 1, 1994.

2. Huntingdon Engineering and Environmental, Inc. North Casper PCE Investigation, Casper, Wyoming. August 5, 1994.

3. U.S. Bureau of the Census. 1990. Public Law 94-171. Washington D.C.

4. ATSDR. Agency for Toxic Substances and Disease Registry. Health Consultation concerning 1153 North Beech, Casper, Natrona County, Wyoming. Atlanta: US Department of Health and Human Services; April 19, 1993.

5. ATSDR. Agency for Toxic Substances and Disease Registry. Record of Activity. Donissa Duvic. March 28, 1991.

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8. WDEQ. Wyoming Department of Environmental Quality. News Release: DEQ to Sample Indoor Air Again. March 24, 1997.

9. WDEQ. Wyoming Department of Environmental Quality. North Casper Perchloroethylene (PCE) Analysis Summary Sheet: March 4, 1996 through March 8, 1996. March 12, 1996.

10. WDEQ. Wyoming Department of Environmental Quality. North Casper Perchloroethylene (PCE) Sample and Analysis Summary Sheet: August 27, 1996 through September 4, 1996.

11. WDEQ. Wyoming Department of Environmental Quality. North Casper Perchloroethylene (PCE) Sample and Analysis Summary Sheet: March 31, 1997 through April 7, 1997.

12. WDEQ. North Casper Study: EPA Toxic Sampling Method TO-14 Sampling Specifics. Date of Sampling: 5/27/98 - 5/28/98.

13. ATSDR. Agency for Toxic Substances and Disease Registry. Toxicological profile for Tetrachloroethylene. Atlanta: US Department of Health and Human Services; September 1997.

14. EPA. United States Environmental Protection Agency; Wyoming Department of Environmental Quality; City of Casper, Wyoming; City of Casper - Natrona County Health Department Fact Sheet: North Casper Site, Casper, Wyoming. June 1994.

15. EPA. United States Environmental Protection Agency, Wyoming Department of Environmental Quality. Fact Sheet: Environmental Issues, Natrona County, Wyoming, Update No. 23. February 1997.

16. EPA. United States Environmental Protection Agency, Wyoming Department of Environmental Quality; City of Casper, Wyoming; City of Casper - Natrona County Health Department. Fact Sheet: Casper, Wyoming. September 1994.

17. EPA. United States Environmental Protection Agency ; Wyoming Department of Environmental Quality; City of Casper, Wyoming; City of Casper - Natrona County Health Department. Fact Sheet: Casper, Wyoming. March 1995.

18. WDEQ. Wyoming Department of Environmental Quality. Letter from Dennis Hemmer, Director, WDEQ to Glenn J. Tucker, Ph.D., ATSDR concerning the North Casper Private Well Survey. October 23. 1995.

Appendix A

Comments on the North Casper PCE Plume Site
Petitioned Health Consultation
Comment Period: August 28, 1998 through September 27, 1998

Comment 1:

There has been only one occasion when a proper indoor air study using an OVA (Organic Vapor Analyzer) and Gillian pump was conducted. At that time the OVA monitor indicated 500 to 600 [no units given] during a walk-through of the home prior to using the Gillian pump to collect a sample. Unfortunately, May is not the ideal time of year for conducting such a study because high groundwater levels mask the PCE vapors. The results of tests conducted from December through March would be more relevant because there would be higher readings due to the lower groundwater levels and decreased ventilation in homes. So far, the majority of indoor air samples have been collected in Tedlar bags. Also, samples collected during the summer were from ventilated rooms under improper conditions.

Response to Comment 1:

Different monitoring and sampling equipment are used for different purposes. For example, the EPA used an OVA and Gillian pump during its May 1991 investigation of the indoor air in one residence. The OVA is a monitoring device that is used to screen for the presence of any volatile organic compound. This device does not distinguish between PCE and, for example, gasoline, natural gas, solvents, or vapors from some cleaning supplies. The Gillian pump, on the other hand, is part of a sampling device used to draw air through a sampling tube (in this case carbon or charcoal) at a specified rate. The contents of the sampling tube are then analyzed in a laboratory.

WDEQ has used two different methods of collecting air samples. Beginning in 1994, WDEQ collected air samples from each of several different residences using a device to draw air through teflon tubing into Tedlar sample bags. The air samples were then sent to a laboratory for analysis. In May 1998, WDEQ began using SUMMA™ canisters to collect residential air samples. The SUMMA™ canister is a device that collects a six liter volume of air and is then sent to a lab for analysis. ATSDR evaluated the results obtained for those residences in which both sampling methods were used and found the results to be similar.

Since May 1994, a total of 120 locations have been sampled during the months of January, February, March, and April. All of these samples were collected with Tedlar bags. A total of 144 locations have been sampled during the months of May, June, August, and September. Ten of these locations were sampled in May 1998 using the SUMMA™ canisters. ATSDR compared the most recent data (1996-1998) and found that the results from samples collected during the winter were not significantly different from those collected during the summer.

While the sampling and analysis requirements associated with the SUMMA™ canister are the most rigorous of all the methods described here, each method has advantages and disadvantages. However, if air sampling is conducted properly with the appropriate QA/QC methods, each sampling method provides useable results. ATSDR reviewed the available QA/QC for both the Summa canister and Tedlar bag data and determined that appropriate QA/QC methods were used.

One of the important considerations in collecting samples is to collect them so that they are representative of the conditions being investigated. For example, if a residence is normally ventilated during the summer, it should remain ventilated during summer sampling activities in order to mimic actual exposure conditions.

Comment 2:

Residents were informed that if they had dry cleaning materials in the home for more than a month, the materials would have no effect on the test results. However, the contaminant levels found were dismissed with the explanation that household materials affected the test results.

Response to Comment 2:

Dry cleaned clothes stored for a month or more, particularly if removed from bags, would probably not affect the test results. However, PCE is also used in some commercially available products such as automobile brake cleaners, suede protectors, water repellants, silicone lubricants, fabric finishers, spot removers, adhesives, and wood cleaners. If stored and used in the household, these products could affect the indoor air sampling results. However, in reviewing the 1996-1998 indoor air data, ATSDR did not assume that any of the PCE or other contaminant levels were due to the presence of household products.

Comment 3:

The data is inadequate for making a final determination because of:
- the lack of a uniform, quarterly testing schedule
- the use of improper equipment
- an uncontrolled environment during the tests

Response to Comment 3:

Although testing has not been done on a quarterly basis, there have been six testing events between May 1994 and May 1998. As indicated in the response to Comment 1, a total of 120 locations have been sampled during the "winter" months. A total of 144 locations have been sampled during the "summer" months. In May 1998, WDEQ began collecting samples using Summa canisters and reportedly plans to continue this type of sampling on a semi-annual basis.

Three different air sampling methods have been used during indoor air investigations in North Casper. While some methods are better for certain conditions than others, all the methods provide useful information. Also, as described in the response to Comment 1, it is important to collect samples which are "representative" of actual exposure conditions.

Comment 4:

There is a trailer park in the area where residents use groundwater as their only source of drinking water. On several occasions, the wells tested positive for PCE and TCE. In fact, PCE has exceeded the safe drinking water standards. However, after a period of time, the EPA reduced the monitoring requirements of the trailer park owner. There is no assurance that the property owner is conducting the water tests properly because EPA has conducted no simultaneous, independent tests. The trailer park should be considered in ATSDR's decision because it is located in North Casper. All North Casper residents have been advised not to drink the groundwater. The trailer park residents should not be allowed to continue using well water as their only source of drinking water.

Response to Comment 4:

ATSDR contacted the appropriate officials in the EPA Drinking Water office in Denver to alert them to these concerns and to request information, including analytical data, on the drinking water supply for the trailer park. In 1989 TCE was found in the well water at the Riverside Mobile Home Court with levels as high as 14 ppb. To date, no PCE has been found in the trailer park's well water [1].

The trailer park, Riverside Mobile Home Court, is served by two wells that are 50-60 feet deep. These wells are located to the west of both the "east" and "west" PCE plumes in North Casper. After TCE contamination was found in the well water, a treatment system was installed. In the current treatment system, water is pumped directly to two activated charcoal filters in series [2]. Like all public water supplies in Wyoming, the owner of the system collects samples for compliance monitoring and submits them for analysis to a certified laboratory [2,3]. The analytical results are then reported to the EPA. In general, compliance monitoring frequency varies depending on the items being monitored, the size of the system, the type of water source, and the specific monitoring schedule set up by the EPA [3]. In this case, the owner's compliance monitoring schedule requires annual testing for VOCs [4].

Although EPA periodically collects samples independently, these samples are not collected simultaneously with samples collected for compliance monitoring. ATSDR reviewed the most recent EPA well sampling results along with the corresponding QA/QC data. In March 1998, TCE was found at 1.41 ppb and PCE was not not found, using a detection limit of 1.0 ppb [5].

ATSDR also reviewed the most recent VOC results and QA/QC data from the compliance monitoring conducted by the owner of the trailer park. Results from November 1997 did not indicate the presence of TCE or PCE in the treated (filtered) water [6]. In June 1998, a sample of well water prior to treatment showed 0.81 ppb TCE and no PCE [7]. The 1998 treated water sample showed 0.51 ppb TCE, 0.5 ppb 1,1,1-TCA, and no PCE [8]. The most recent sample of treated water, collected on June 10, 1999, showed no TCE or PCE, using a detection level of 0.5 ppb [9]. None of the data reviewed by ATSDR showed the presence of vinyl chloride, a degradation product of TCE.

The most recent sampling results in which VOCs were found in the Riverside Mobile Home Court water supply are from the June 1998 sampling activities. At that time, TCE and 1,1,1-TCA were found at low levels in samples of the treated well water. These levels are less than ATSDR Comparison Values which means that even long-term exposure to drinking water at those levels would not result in an increase in the likelihood of developing adverse health effects.

Comment 5:

After considerable discussion about residents' reports of potential health impacts from the chemicals found in the groundwater and air, a citizens group developed a health survey. The survey was developed by referring to reliable databases listing chemical exposure effects. The summary from the first survey was sent to ATSDR. Fifty families from North Casper were interviewed and another 50 families outside the area (in other parts of Casper) were interviewed. In comparison to residents from other parts of Casper, North Casper residents showed higher

percentages of health problems. Rather than examining these results further, ATSDR ignored the information.

Response to Comment 5:

In March 1994, ATSDR received a petition requesting a health study for the North Casper area. The letter also included a sample health survey questionnaire and a tabularized summary of an informal health survey conducted in the community. The summary reported the percentages of occurrence for a series of health problems in a North Casper population group compared to a "Random Control Group". ATSDR reviewed the survey summary as part of the petition review process. ATSDR wrote a letter to the petitioner on April 5, 1994 acknowledging the petitioner's request for a health study. However, ATSDR indicated that a public health assessment or health consultation is normally the first step in determining the possible health hazards related to a site. If appropriate, public health actions such as health studies are recommended after an initial assessment process. To date, ATSDR has not recommended a health study in North Casper because there is no indication that known exposures would cause adverse health effects.

Comment 6:

In 1994, an upgraded survey was conducted throughout North Casper. One person conducted the survey in order to ensure consistency in the interviews. Notes were made of any additional comments volunteered by the respondents. While not a scientific study or professional health assessment, this information warrants ATSDR's review and may serve as the basis for further study.

Response to Comment 6:

ATSDR's Division of Health Studies reviewed the 1994-1995 health questionnaires and interview notes that were provided. After evaluating the methods and results of the health survey, ATSDR is unable to draw any conclusions about the reported health problems. The following is a summary of ATSDR's evaluation:

Based on 1990 U.S. Census data, the number of people living within 1 mile of the site is 3577. This number includes 689 adults aged 65 and older, comprising 22% of the total population.

The statistics obtained from the surveys are as follows:

- Number of households surveyed: 61
- Number of people surveyed: 149 (1.4% of site population)
- Number of adults included in the survey: 103 (70% of the total)

- Number of children included in the survey: 46 (30%)
- Number of adults 65 years and older included in the survey: 36 (24%)

Main Health Concerns*	
Corrective lenses/Vision: 68 (46%)	Heart Disease: 12 (8%)
Skin:33 (22%)	Nasal: 34 (23%)
Reproductive/Birth Defects: 11 (7%)	Throat/Gum: 30 (20%)
Headache: 29 (20%)	Hearing: 21 (14%)
Hair Loss: 7 (5%)	Arthritis: 31 (21%)
Memory Loss: 11 (7%)	Balance Loss/Tremor: 13 (9%)
Tumor: 8 (5%)	Dizziness: 12 (8%)
Nervousness 13 (9%)	Learning disorders: 9 (6%)
**reported by 5 or more people*	

The survey participants consisted of 1.4% of all residents living within one mile of the site. Survey participants were selected in a non-random fashion. As a result of the non-random selection and the participation of only a small sample of residents, the group may not be representative of the community as a whole.

Since no data about the comparison population were provided, ATSDR is unable to assess the statement that "higher percentages of health problems were found when compared to a comparison population in Casper area residents". However, based on the limited available information, the population in the Casper area used as a comparison group may not be appropriate. The comparison group consisted of students (and their families) from a class at the Casper Community College because it was a convenient way to get a group representing 50 families throughout Casper. Students are more likely to be young and healthy compared with the North Casper population, which is reported to have a higher percentage of retirees and lower income families.

Please see the response to Comment 5 for additional information about health surveys in North Casper.

Comment 7:

There is one residence where the well water has shown consistent levels of PCE. Three unrelated people living in the home developed similar health problems, including cancer and blindness. One of these three people is now deceased.

Response to Comment 7:

ATSDR is aware of the concern that many residents have about the presence of contaminated groundwater beneath homes in parts of North Casper. ATSDR reviewed the available data for the site and determined that there are two exposure paths of concern.

The first potential exposure pathway is the use of private wells for potable purposes. This residence is located in the area of the east plume. WDEQ and the City of Casper-Natrona County Health Department tested for PCE in this residential well in 1991, 1992, 1993, and 1994. The results ranged from 34-50 ppb PCE. ATSDR evaluated the potential health effects of these levels based on what is currently known about the toxicological effects of PCE in drinking water. These PCE levels would not be expected to produce adverse health effects, even if consumed in drinking water over a person's lifetime. However, because groundwater levels exceed the EPA Maximum Contaminant Level (MCL), WDEQ continues to advise residents not to drink water from private wells.

The second exposure pathway is the infiltration of PCE vapors from the groundwater into residential indoor air. In this residence, the measured PCE levels ranged from below detection to 5 ppb. The PCE level found in May 1998 using a Summa canister was 1.4 ppb. Based on the indoor air levels of PCE found in the home, there does not appear to be a risk for adverse health effects from inhalation.

Comment 8:

In one health consultation, ATSDR told a mother and her baby's physician that PCE vapor was not known to cause heart problems. However, ATSDR later provided information on the health effects of PCE which stated that heart defects are a known symptom of PCE exposure.

Response to Comment 8:

In June 1991, ATSDR documented a medical consultation and prepared a health consultation concerning the levels of PCE in indoor air in a residence in North Casper. The ATSDR physician concluded that "the compounds seen at this residence are at levels that have not been associated with congenital malformations." No cardiac malformations have been "associated

with them at any level; therefore, it does not appear likely that this exposure is related at all to the child's defects." ATSDR concluded that the levels found in that home should not pose a health risk to the child [10].

No inhalation studies on the potential developmental effects of PCE have been done in humans, but studies in animals (mice, rabbits, and rats) suggest that PCE does not induce birth defects of any kind below levels that are significantly toxic to the mother (greater than 100 ppm) [11, 12,13].

Although no studies have been done specifically on babies, the available data suggest that the PCE levels measured in indoor air in North Casper should have no adverse effects of any kind, including heart problems, on infants, adults, or animals. Several inhalation studies have indicated no effects on the hearts of adult volunteers exposed to as much as 100-150 ppm PCE for 5.5-7.5 hours a day, five days a week [14,15]. Much higher exposures (5,000-10,000 ppm) did not induce cardiac arrhythmias in dogs [16]. Only two types of cardiac effects in humans have been reported. One was a temporary cardiac arrhythmia in a dry cleaning worker exposed to high levels, possibly exceeding 100,000 ppb, judging from the high levels (3.8 ppm) detected in the blood plasma [17]. The other was hypotension in a male laundry worker found lying in a pool of PCE [18]. Neither of these effects is relevant to the known exposures occurring in North Casper.

Comment 9:

In addition to PCE and TCE, other contaminants have been found. The entire area is downwind from a refinery where asbestos, BTEX (benzene, toluene, ethyl benzene, and xylene), and other solvents have been released into the air and groundwater. Although, the area has never been fully investigated these contaminants are suspected to have impacted all of North Casper. This is a residential area and consideration must be given to any potential effects from both known and suspected chemical contamination.

Response to Comment 9:

As a result of the existing exposure of residences to PCE in indoor air, ATSDR has focused its recent efforts on evaluating the available data on indoor air contaminants. ATSDR previously reviewed soil gas data to evaluate exposures to PCE vapors from soil and will issue a follow-up health consultation to further address groundwater and municipal drinking water concerns in the North Casper area.

ATSDR has become aware of local citizens' interest in a more comprehensive environmental investigation of the North Casper area. ATSDR is currently attempting to address these concerns

by seeking additional information from EPA on any additional sources of environmental contamination and associated pathways of exposure in North Casper. However, further investigation will require the availability of information for evaluating other specific contaminant sources and determining that the associated exposure pathways are plausible.

Comment 10:

In an article in the Casper Star Tribune and elsewhere, the USEPA has classified North Casper as a hazardous waste site. However, residents are being told that nothing is wrong here. What's going on?

Response to Comment 10:

The USEPA and WDEQ have documented that groundwater contaminated with PCE and TCE exists in the North Casper area in two main ("east" and "west") groundwater plumes. EPA classifies PCE and TCE as hazardous substances. However, the only identified exposure route of concern for these plumes is the infiltration of PCE and other VOCs into the air in some residences. In addition, TCE has been found in small amounts in the well water for the Riverside Mobile Home Court. ATSDR reviewed the available data showing actual levels of exposure and determined that the levels found are not likely to cause any adverse health effects.

Comment 11:

Residents of North Casper have a right to be protected from pollution and to have clean air, pure well water, land that is safe to live on, and gardens that can be grown so that PCE vapors do not break down in the vegetables. WDEQ says that everything is okay. Why does ATSDR allow this to be said?

Response to Comment 11:

ATSDR is a federal public health agency that is part of the Public Health Service. ATSDR is not a regulatory agency like EPA and does not conduct environmental cleanups. ATSDR reviews information about hazardous substances at a site and evaluates whether exposure to those substances might cause harm to people.

At the North Casper PCE site, ATSDR's primary focus has been to determine if any exposures of concern are actually occurring. Exposures to contaminated indoor air have been documented. ATSDR evaluated the available indoor air data and determined that the current levels of exposure are not likely to cause any adverse health effects.

Exposure to contaminated groundwater may have occurred in the past before residents were warned not to drink the water from private wells. The highest level of PCE found in a private well in North Casper was 50 ppb in 1991. Previous PCE levels are unknown. However, as stated in the response to Comment 7, the consumption of drinking water contaminated with 50 ppb PCE would not be expected to cause adverse health effects.

Comment 12:

The EPA and WDEQ should do their jobs and clean up the contamination in North Casper.

Response to Comment 12:

See the response to Comment 11.

References for Appendix A

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2. EPA. Letter from David E. Robbins, United States Environmental Protection Agency to Gail Scogin, Agency for Toxic Substances and Disease Registry. Re: PWS ID #5600072 Drinking Water Data Request. July 9, 1999.

3. EPA. Safe Drinking Water Hotline. July 13, 1999.

4. EPA. Riverside Trailer Court: Testing History and Current Requirements for Chem/Rads. July 2, 1998.

5. ELI. Energy Laboratories, Inc. #5600072 C, Riverside Trailer Court. EPA Method 524.2. Date Reported: March 23, 1998.

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7. ELI. Energy Laboratories, Inc. Drinking Water Analysis Report - EPA Method 502.2 for Riverside Mobile Home Court - Raw. Report Date: July 20, 1998.

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